

DYNACALC



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Introduction

DYNACALC™ turns your Tandy Color Computer (with OS-9 Operating System) into an electronic worksheet, letting you organize columns and rows of data. This program lets you manipulate data instantly — moving, deleting, or inserting columns or rows with the touch of a key. Change a value and the entire worksheet is automatically recalculated. These capabilities make DYNACALC a dynamic planning and forecasting tool.

The applications for DYNACALC are limitless. Use it for budgeting, cash management, inventory analysis, income tax preparation, portfolio management.

Once you familiarize yourself with the various commands and functions, you will find DYNACALC is one of your most sophisticated management tools.

Features

- Uses the OS-9 Operating System
- Handles all types of data — numbers, labels, and equations
- Creates a worksheet of 256 columns and 256 rows
- Provides printer output
- Contains over 24 built-in mathematical functions
- Performs all regular math operations to 16-digit accuracy
- Reads and writes OS-9 data files

Equipment Requirements

- Tandy Color Computer with 64K RAM and at least one disk drive
- Television Set (color recommended)

Optional Equipment

- Printer, such as the Tandy DMP-110 (Cat. No. 26-1271)
- OS-9 Operating System (Cat. No. 26-3030)
- Joystick or Color Mouse

Getting Started

Loading and Running DYNACALC

Before running DYNACALC, make a backup of the program diskette that came with the package. (Refer to Appendix A, "Format and Backup Instructions," for further instructions.) Place the original program diskette in a safe place and use only your backup copy for running the program.

Since DYNACALC runs on the OS-9 operating system, use your standard OS-9 boot procedure to start the program. If you do not have a standard OS-9 boot procedure, refer to Appendix E.

When the DYNACALC copyright appears on the screen, press **ENTER** to access the DYNACALC worksheet. If you have only one drive, you can save your worksheet data on the DYNACALC program diskette.

If you have two disk drives, insert the formatted data diskette into Drive 1, and save files to that drive.

Viewing the Worksheet

The worksheet that appears on the screen is shown below:

A1
C/A 7761 READY

		[A]	[B]	[C]	
1 -					
2 -					
3 -					
4 -					
5 -					
6 -					
7 -					
8 -					
9 -					
10 -					
11 -					
12 -					

This screen is a “window” into a worksheet divided into a rectangular array of **columns** (vertical) and **rows** (horizontal). The entire worksheet consists of 256 columns and 256 rows. The columns are identified with letters across the top of the worksheet, and the numbers, along the left edge of the screen, identify the rows. At each intersection of a column and a row, there is a space or **cell**, and each cell is identified by its **address** (column and row label, such as A3).

Cells contain either a **value** (numeric constant), a **label** (alphanumeric message), or an **expression** (mathematical operation). A cell can contain only one type of data at a time.

The three lines in the upper left corner of the screen are message areas. Line 1 gives you current cell information. The current cursor location is shown, and when the cursor is located in a cell containing data, the letter **V**, **L**, or **E** is displayed to indicate the type of data. The data you entered into the cell is also shown at the end of the line.

Line 2 displays general operating information, such as mode and memory. When you first begin DYNACALC, the letters C/A appear at the beginning of this line. These letters represent default modes that cause the program to calculate columns first and then automatically recalculate after each entry. (You can change these settings using the Attribute command discussed in the Commands and Functions section.)

This line also displays the number of bytes of system memory that have been used. This number varies as you add and delete data. The total amount of memory is 20K.

Line 2 also indicates the current operating mode. When READY appears on the screen, the program can accept keyboard input. The READY message is not displayed when you are printing or while the Command Menu is displayed.

Line 3 is a data entry area where you enter and edit the cell contents.

Moving the Cursor

When you first start the program, the flashing box (cursor) is located in the first cell (A1). Use the arrow keys to move the cursor from cell to cell. Each time the cursor moves, the cell address shown on the first message line changes.

When you move the cursor beyond the edges of the screen, the column and/or row labels change to reflect the new section of the worksheet you are viewing.

DYNACALC provides a GOTO command that lets you move directly to a specific cell. Access this command by pressing the “greater than” (>) symbol. GOTO: appears in Line 3 at the top of the screen. You can type a cell address (column, row) and then press **ENTER** to move the cursor to the specified cell.

You can quickly return to the top left corner of the worksheet (A1) by pressing **SHIFT** .

Note: If you define your labels as titles (see Titles command in the Commands and Functions section), the cursor cannot move into those cells. If you use the above command **SHIFT** , the cursor returns to the closest possible point to A1.

If you wish, you can also use a Joystick or Mouse to move the cursor. Plug one of these items into either Joystick port on the rear panel of your Color Computer, and transfer cursor control to the device by pressing the "fire" button. To return control to the keyboard, press the "fire" button again or press any arrow key.

When you are using the Joystick or Mouse, you cannot move the cursor off the current screen. To move to a different part of the worksheet, use the arrow keys or the GOTO command. You can then return cursor control to the Joystick or Mouse by pressing the "fire" button.

Entering Data

To enter either a value, label, or expression, move the cursor to the appropriate cell using the arrow keys or the GOTO command. The cell can hold up to 9 characters (cell default width). If the data is more than 9 characters, the right-most characters are dropped when the data moves into the cell. All data, however, is maintained in memory. (For information on changing the size of the cell, refer to the Attribute commands in the Commands and Functions section.)

The methods for entering the three types of data are described below:

Value

A value is any numeric constant. For example, 2, 3.4, -12, .09, and 3.8E6 are all valid numbers. As soon as you begin entering a numeric value in a cell, DYNACALC recognizes that it is a number and replaces **READY** in Line 2 with the word **VALUE**.

The cursor moves from the cell location to the data entry line (Line 3) above the worksheet. The number you are entering appears in this line as you type it. After you finish typing the value, press **ENTER**. The value moves to the current cell location.

Note: DYNACALC does not recognize a comma as part of a valid number and does not allow you to enter it.

Label

When the cursor is positioned in a cell, type the label (or message) you want to display. Notice that the label you are typing appears both in the current cell location and Line 3. Press **ENTER** when the label is complete.

If you start the label with a letter, DYNACALC recognizes it as a label, and the word **LABEL** appears in Line 2. To begin your label with a number, enter a single quote (**SHIFT** **7**) as the first character. (This character does not appear on the screen.) This lets the program know the number is actually part of a label. It is not necessary to end the label with another quote mark.

Expression

An expression is a mathematical equation, using constant values, cell addresses, and operators.

With the cursor located in a cell where you want the results of an equation to appear, type the expression. If your expression starts with a letter (such as A1 . . .), you must distinguish between a label and an expression by beginning the expression with an operator, such as “+,” or enclosing the expression in parentheses. Press **ENTER** when you finish typing the expression.

Note: The word **VALUE** appears in Line 2 when you are typing an expression since the resulting data is a number.

The current cell then displays the **results** of the equation (0 if you have not yet entered data). Whenever you change a value in any cell that is part of the equation, the resulting value from the equation also changes.

Error Correction

When you are entering data, you can easily correct the data before transferring it into the current cell by using the **BREAK** key. Pressing **BREAK** moves the cursor backwards through the line, erasing each character. Retype the data, and when it is correct, press **ENTER** to transfer it into the cell.

Note: More advanced editing techniques are available using the Edit command described in the Commands and Functions section.

Sample Session

To become familiar with DYNACALC's fundamental operation, complete this Sample Session. In this section, you will create a worksheet for a monthly budget. You will practice moving around on the worksheet and inserting all types of data — values, labels, and expressions. You will quickly see how easy DYNACALC is to use.

After you complete this Sample Session, you will save it so you can use it in the Advanced Sample Session to practice some of the more advanced commands discussed in the Commands and Functions section.

If you have not yet backed up your DYNACALC diskette, do so before proceeding with this section. Load the program as described in the "Getting Started" section, and access the worksheet screen. You are now ready to begin.

Designing Your Worksheet

Before you begin entering data into the program, you need to set up your worksheet on paper. Taking time to do some planning on paper will help you visualize the entire worksheet and enter your data more quickly. The following table shows the outline for our sample monthly budget:

	A	B	C	D	E	F	G	H	I	J
1			APRIL	BUDGET						
2			INCOME	1000.00						
3										
4	BUDGET		BUDGETED		ACTUAL					
5	CATEGORY		AMOUNT		AMOUNT		VARIANCE			
6										
7	RENT									
8	CAR/GAS									
9	FOOD									
10	MISC.									
11										
12										
13										

Entering Labels

To enter the labels for your worksheet, refer to the preceding table for cell locations. First, enter the worksheet title, "APRIL BUDGET," in cells C1 and D1.

1. After you access the worksheet, the cursor is located in cell A1. Press  twice to move the cursor to C1.
2. In cell C1, type:

APRIL

When you begin typing, the cursor moves to Line 3, and as you type, the word appears not only in Line 3 but also in the cell.

Note: If you make a typing mistake in Line 3, press **(BREAK)** to move backwards through the line and erase the characters.

3. Press **(ENTER)** after completing the word. The cursor returns to the current cell (C1). Move the cursor to cell D1 by pressing .
4. In cell D1, type:

BUDGET **(ENTER)**

The cursor returns to the current cell (D1).

Insert the statement "INCOME 1000.00" directly under the worksheet title:

1. The cursor is located in cell D1. Press   to move the cursor to cell C2. Type:

INCOME **(ENTER)**

2. Press **→** to move to cell D2, and enter the income amount. Since you may want to change this amount at various times, enter it as a value (without a single quote mark):

1000.00 **ENTER**

Notice that when you are typing a value, it appears only in Line 3. When you press **ENTER**, the value is transferred into the current cell, but the zeros in the decimal places are dropped. The value is displayed right justified.

You are now ready to enter your worksheet's column headings:

BUDGET	BUDGETED	ACTUAL	
CATEGORY	AMOUNT	AMOUNT	VARIANCE

1. Move the cursor to A4 and type:

BUDGET **ENTER**

2. Move the cursor to cell A5 and type:

CATEGORY **ENTER**

3. Move the cursor to C4 and type:

BUDGETED **ENTER**

4. Move the cursor to C5 and type:

AMOUNT **ENTER**

5. Move the cursor to E4 and type:

ACTUAL **ENTER**

6. Move the cursor to E5 and type:

AMOUNT **ENTER**

7. Move the cursor to G5 and type:

VARIANCE **(ENTER)**

Now enter the worksheet row labels by moving the cursor to the specified cell and typing the indicated category:

A7 — RENT **(ENTER)**

A8 — CAR/GAS **(ENTER)**

A9 — FOOD **(ENTER)**

A10 — MISC **(ENTER)**

Your worksheet design is now complete, and you are ready to begin entering values.

Entering Values

The following figures indicate the values by category that appear in the **BUDGETED AMOUNT** column:

RENT — 400.00

CAR/GAS — 250.00

FOOD — 150.00

MISC — 200.00

Enter these values in the specified cells:

C7 — 400.00 **(ENTER)**

C8 — 250.00 **(ENTER)**

C9 — 150.00 **(ENTER)**

C10 — 200.00 **(ENTER)**

Remember that the zeros to the right of the decimal point are dropped. The program does, however, store these decimal places in memory.

You are now ready to enter values into the **ACTUAL AMOUNT** column. These figures are shown below by category:

RENT — 400.00
CAR/GAS — 240.50
FOOD — 175.00
MISC — 150.00

Enter these values in the specified cells:

E7 — **400.00** **ENTER**

E8 — **240.50** **ENTER**

E9 — **175.00** **ENTER**

E10 — **150.00** **ENTER**

All the data you have entered up to this point can easily be done on paper, but as you enter the expressions in the next section, you will see what a powerful tool DYNACALC is.

Entering Expressions

The last column on your worksheet, "VARIANCE," keeps track of over- or underspending in each category. In order to supply the values in this column, it is necessary to perform a mathematical equation. To find the variance between a budgeted amount and an actual amount spent, you need the following equation:

Budgeted Amount - Actual Amount = Variance

Using the cell address for each part of the equation, you can create an expression that lets DYNACALC automatically perform the mathematical operation.

In our first budget category, RENT, the cell addresses of the BUDGETED AMOUNT (C7) and the ACTUAL AMOUNT (E7) are combined to create the following expression:

C7-E7 = VARIANCE

Since you want the value resulting from this expression to appear in the VARIANCE column, move the cursor to cell G7, and type the expression shown below. Remember that to distinguish an expression from a label, you must enclose the expression in parentheses or begin the expression with a mathematical operator.

(C7-E7) ENTER

After you enter this expression in the data entry line and press **ENTER**, DYNACALC automatically performs the calculation and inserts the resulting value into the VARIANCE column.

You never need to worry about forgetting the expression you used to create this result, because it always appears in the first message line when the cursor is positioned in this cell.

Now enter VARIANCE expressions for the other budget categories in the specified cells, and watch as your results appear!

G8 — (C8-E8) **ENTER**
G9 — (C9-E9) **ENTER**
G10 — (C10-E10) **ENTER**

Your worksheet example is now complete and looks like the following:

APRIL		BUDGET	
INCOME		1000	
BUDGET CATEGORY	BUDGETED AMOUNT	ACTUAL AMOUNT	VARIANCE
RENT	400	400	0
CAR/GAS	250	240.5	9.5
FOOD	150	175	-25
MISC	200	150	50

This Sample Session lets you create a simple, yet useful application and at the same time demonstrates the fundamental capabilities and ease of operation of DYNACALC.

Saving Your Worksheet

Save this worksheet so you can recall it and expand upon it in the Advanced Sample Session.

Since this file is so short, do not worry about saving it on a separate data diskette. You can easily store it on your DYNACALC diskette without affecting the program.

The **SAVE** procedure is a DYNACALC system command and is explained in detail in the Commands and Functions section. Since you are not yet familiar with this command, follow the steps shown below **exactly** to save your worksheet.

1. When **READY** appears in the message line and the cursor is located in any cell on the worksheet, type:

/SS

2. The following message appears in Line 3:

SAVE : PATH NAME?

3. Type in the following filename for this worksheet:

SAMPLE ENTER

4. The red light on the disk drive comes on while the file is being saved. When the **SAVE** procedure is complete, the cursor returns to the worksheet area, and the **READY** message returns to the screen.

You have now completed the Sample Session and are ready to exit the DYNACALC program. To return to the OS-9 operating system, type:

/QO

The following prompt appears in Line 3:

QUIT: ARE YOU SURE?

Type **Y**. The OS9 prompt appears on the screen.

Commands and Functions

Commands

This section of the manual describes, in detail, the DYNACALC commands available for your use, as well as the way arithmetic functions and operations are used. Logical operations are also explained. Use this section to review the more advanced capabilities of your DYNACALC program.

To enter the command mode, be sure that the **READY** message is displayed on the second message line. Type **/**. The **READY** message is replaced by the command menu:

CM: A B C D E F I K L M P Q R S T W ?

Each alphabetic character represents a specific command. Type the appropriate letter to access a specific command. The options for the command appear on the screen. When you are familiar with the commands, you can enter the entire command message (*/command {option}*) at one time, without waiting for the menus to appear.

After DYNACALC has performed a command, **READY** returns to the screen automatically. To exit the command mode without completing the command, press **(CLEAR) (BREAK)**.

Note: When a command message appears on the screen and you are not required to make a response, the message is displayed for a few seconds and then disappears, and **READY** returns to the screen. If you wish to manually clear the message, press **(CLEAR) (BREAK)**.

Help Information

Many of the DYNACALC commands provide a Help screen to explain the various options. A Help screen is designated in a command menu by **?**. To see a summary of instructions for all commands, type **/?** at the **READY** message. The screen displays a list of all commands with short descriptions of the ways in which they are used.

To see help information for an individual command, choose the command, then type ?. You are shown a brief description of the command.

The Attribute Command — /A

The /A command lets you perform miscellaneous operations that do not fit into another command category. At the READY message, type /A. The attribute command menu appears:

ATTR: B D G H L M O P R S T W ?

Any settings you change, such as /AB and /AR, are automatically saved when you save a worksheet with the command, /SS, which is described later.

Console Bell — /AB *

Attribute B “toggles” (reverses) a switch that controls the keyboard “bell” that indicates an operator error. After you enter /AB from the READY message, the message, SIGNAL ON or SIGNAL OFF appears. If you need to reverse the setting after performing the command the first time, you can immediately press /AB again.

* This command may not be available on some versions of OS-9.

Calculating in Degrees or Radians — /AD

Attribute D toggles between calculating in degrees or radians when trigonometric calculations are performed on angles. The switch defaults to degrees.

Characters for Printing Graphs — /AG

Attribute G changes the character used for printing graphs drawn with the /FP or /WFP command. Graphs are printed using the default character of #, but you can change the character to any you prefer. Simply enter the character you wish to use, and press **(ENTER)**. This command affects only graphs to be printed in the future, not anything currently displayed. To use the new character for printing the current screen, use the attribute command M, described below, to redraw the screen.

Deleting Help Information — /AH

Attribute H deletes all help information from memory temporarily. Use this attribute command when you need more diskette space. To restore help information, exit DYNACALC, and restart it. To permanently delete help information from the current worksheet, save this setting using the /SS command.

Label Entry Mode — /AL

Attribute L toggles the label entry mode between off and on. When label entry mode is on, a label that is longer than the cell width automatically continues into the next cell(s). To use label entry mode, be sure that the mode is on. When **READY** reappears, point to the cell at which you wish your label to begin, and start typing. The cell address on Line 1 changes automatically as soon as you type into the next cell. If you later change any of these column widths, you must adjust your labels to fit the new width.

Modify Screen — /AM

Attribute M redraws, or modifies, the screen at any time. Use this command to print the current screen using a new character you have defined with the /AG command.

Calculating Columns or Rows First — /AO

Attribute O toggles a switch that notes the order of calculation. Either columns are calculated first (the default switch setting), such as A1, A2, A3 . . . B1, B2, B3 or rows are calculated first, such as A1, B1, C1 . . . A2, B2, C2. You can see the current setting of this switch on Line 2. C on the second message line means that columns are calculated first. R on this line denotes that rows are calculated first.

Printer/Textfile Attributes — /AP

Attribute P lets you examine or change the setting of your printer/textfile attributes. When you type /AP, a new menu of options appears:

PRINTER: B C L P S W ?

/APB toggles a flag that determines whether to print DYNACALC'S borders on the printer/textfile. The default is off.

/APC closes the current printer device or file. The next time you request a printer operation (/P), you are also asked if you want to delete the original. Answer Y to the prompt. You are then asked to enter a device or filename.

/APL lets you change the number of lines per page to print. The prompt **INES PER PAGE** appears and displays the current number. Enter the new number of lines per page. The minimum number is 11, and the maximum is 255. The default is set to 58.

/APP toggles the flag that denotes whether to paginate the output. The default is on.

/APS displays the message **LINE SPACING** and shows the current setting. The default is 1, but you can select any number up to and including 8.

/APW lets you change the maximum number of characters to print across a page. The message **PRINTER WIDTH** is displayed, along with the setting. The default is 80 characters, and the maximum is 255.

Automatic Recalculation — /AR

Attribute R toggles the switch controlling DYNACALC'S automatic recalculation feature. When the switch is on (the default setting), you see an **A** after the **C** or **R** message on the second message line, and your worksheet is automatically recalculated after you change the value in any cell. If you turn off the switch, **M** is displayed in the second message line, denoting manual recalculation. (Press **!** at the **READY** message to recalculate a worksheet.)

Worksheet Size — /AS

Attribute S displays the cell address on Line 2 of the “highest” column/row in use in the current worksheet. This lets you keep track of the total size of your worksheet, including parts of the worksheet not currently displayed. This command also helps you manage your available memory to fit the worksheet you are using. See the discussion of memory allocation in Appendix B, “Advanced Operating Tips,” for more information.

Doublechecking Changes — /AT

Attribute T toggles the “type protection” switch, which defaults to off. Type protection makes DYNACALC display **ARE YOU SURE?** if you try to change a label or expression. This prevents accidental change to important information in your worksheet when you are entering data.

Column Width — /AW

Attribute W lets you change the displayed column width. When you type **/AW**, a new menu appears:

COLUMN WIDTH: C W ?

Choosing option C lets you change the width of only the current column. Option W changes the width of all columns displayed in the current window. The default width for individual columns is the current window column width. The default window column width is 9.

The Blank Cell Command — /B

Use this command to delete data in the current cell. After you type **/B**, DYNACALC asks you to confirm that you want to erase the data in the cell. Answer **Y** or **N**. The data in the cell is erased, leaving the cell's format intact.

The Clear Worksheet Command — /C

Use this command to clear **all** data in the worksheet. Make sure that your worksheet is saved on diskette if it is of value to you. Answer **Y** to clear the worksheet data or **N** to ignore the Clear command.

The Delete Command — /D

This command lets you delete data in an entire column or row of the worksheet. Position the cursor at the beginning of the row or column you want to delete. Type **/D**. A new menu appears:

DELETE: C R ?

Enter **C** to delete the current column's data or **R** to delete data in the current row.

If you delete a column or row of data and DYNACALC can no longer calculate an expression that references that cell, an **>ER<** message appears in the cell containing the expression, and Line 1, where the expression is displayed, indicates **@ERROR** for the deleted cell.

References to cells beyond the deleted data area are adjusted to reflect the new column letters or row numbers. Remember to take this into account when you enter new expressions.

The Edit Command — /E

This command lets you edit the contents of the current cell. After you type **/E**, the cell's contents are displayed on the data entry line. You can insert new characters, delete existing ones, or overtype old characters with new.

Pressing **←** moves the cursor one space to the left. Similarly, **→** moves the cursor right one space. **↑** moves the cursor to the beginning of the edit line, and **↓** moves the cursor to the end of the line. No data is deleted.

When you reach the desired location in the edit line, any characters you type are inserted at that point. To delete a character, move the cursor one character to the right of the one to be deleted, then press **BREAK**. The character disappears, and the line moves left to close up the space.

To delete from a point in the line to the line's end, move the cursor to the first character you wish to delete, and press **SHIFT** **↑**.

To overstrike, or "overlay," press **SHIFT** **←**. Type the new character(s). The old are replaced with the new, without changing the length of the line. While in overlay mode, you can still use the arrow keys to move the cursor without making changes. Note, however, that **CLEAR** is ignored in this mode. To exit the overlay mode, press **SHIFT** **←** again.

When you finish editing the line, press **ENTER** to store the new data in the cell.

The Format Command — /F

This command lets you insert more than one display format in the same window. (See the discussion of /WF, the window format command, for instructions on formatting an entire window.)

To choose a format for the current cell, type **/F**. The following menu appears:

FORMATS: D G R L P I \$ C ?

Each of these characters represents one of the formats described below. If a format has been selected for the current cell, it is displayed in the data entry line.

Default Format — /FD

This format command causes the current cell's format to default to the format of the current window.

General Format — /FG

This format command, which is the general format, left-justifies labels and right-justifies numbers within the current cell.

Right-Justification Format — /FR

Use this command to right-justify any label or number in the current cell.

Left-Justification Format — /FL

Using this command left-justifies labels or numbers in the current cell.

Plotting Format — /FP

Choosing this command activates the plotting format, used for creating horizontal bar graphs within your worksheet. The number in the cell is rounded to the nearest integer, and the resulting number is used in counting graph characters as they print.

For example, if a cell has a value of 2.4, this format rounds it to 2 and prints 2 graph characters in the cell. Suppose that you increase the number to 5.1. Five graph characters then replace the previous 2.

Refer to “Characters for Printing Graphs — /AG” for information on graph characters.

Integer Format — /FI

When a cell is formatted using this command, any value displayed in that cell is rounded to the nearest whole number and right-justified within the cell. Rounding affects only the number displayed, not the actual number stored in memory. If you reference the cell in an expression, its original, unrounded value is used.

Dollar Format — /F\$

Use this format for figures to be rounded to two decimal places (such as dollar amounts). The cell’s value is displayed with a decimal point and two following digits, even if those digits are 0s. Rounding affects only the number displayed, not the actual number stored in memory. As in the /FI command, if you reference a cell formatted with this command in an expression, its original, unrounded value is used.

Continuous Format — /FC

Use this format command only for cells containing labels. This format uses a character(s) entered in repetition to fill the width of the cell, regardless of its current or future width. A typical use for this type of format is creating borders between rows. For example, if you enter one hyphen (-) as a label and then select /FC, the entire cell is filled with hyphens (-----).

The Insert Command — /I

This command lets you insert a blank column or row into an existing worksheet. Move the cursor to the column or row at which you want the new column or row to appear, and type /I. A new menu appears:

INSERT: C R ?

Type **C** to insert a column or **R** to insert a row. The new column or row appears, and any references to cells beyond the inserted area are automatically adjusted to reflect the new column's or row's position. Remember the new column or row when you enter new expressions.

The Keysaver Command — /K

DYNACALC'S Keysaver™ permits execution of multiple commands. For example, to delete 12 rows from a worksheet without using the Keysaver, you must type /DR 12 times. Using Keysaver, DYNACALC automatically repeats a command any number of times.

To use Keysaver, perform a command once that you want to repeat, then type /K. The message, TIMES?, appears. Enter the remaining number of times you want to repeat the original command, and press **ENTER**.

You can use Keysaver with any DYNACALC command, as well as with arrow key movement and other special key-strokes. Suggested uses for Keysaver include setting column formats, deleting and inserting columns and rows, using with # to convert expressions into values, and clearing ranges of cells.

The Locate Label Command — /L

This command lets you quickly find the location of a specified label. It is useful if your worksheet is very large.

Type **/L** to execute the command. The prompt, **SEARCH FOR:** appears. Enter the text string, or sequence of characters, for which you want DYNACALC to search. Note that if you enter, for example, Bath as the search string, DYNACALC might find the labels BATHROOM or BATHTUB (but not BAT).

When a match is found, DYNACALC displays the address of the cell containing the label, along with the entire contents of that cell, on the top line of the screen. Line 2 asks **MOVE?** Answer **N** to continue searching for other matches or **Y** to move the cursor to the cell that matches.

Note: If a label spans more than one cell, a search locates only the specific cell in which the string appears.

You can include two special characters in your search string. ? at any point in the string acts as a wild card. If your search string is **c?t**, DYNACALC finds CAT, COT, or CUT. You can include any number of wild card characters in your search string.

The second special character is @. If you place this character in the first position of a character string you wish to find, DYNACALC finds an exact match.

The Move command — /M

Use this command to move columns or rows from one place to another within a worksheet. You can move the columns/rows manually or with DYNACALC'S sort feature. After a move, the column and/or row addresses and any references to these addresses are automatically adjusted by DYNACALC. When you enter new expressions, be sure to remember that you have moved columns and rows.

After you type **/M**, a new menu appears:

MOVE: A D M ?

Ascending Sort — /MA

The ascending sort command causes DYNACALC to sort all or part of your worksheet data in ascending order — alphabetic order, followed by numeric labels (must begin with '@'), and finally numbers in algebraic order. After you type **/MA**, you see the prompt, **RANGE?** Respond with the addresses of the first and last cells you wish to use as a sort key. If your range is two cells in a single column, that range is used as the key to sort and move all rows between the first and last addresses given, inclusively. If you specify two cells in a single row, that range of cells is used as the key to sort and move all columns between the first and last addresses given, inclusively. Note that all cells in the same column/row are moved by the sort.

You can force a numeric label to sort first by preceding it with '@'.

Descending Sort — /MD

This sort works in the same way as the ascending sort but reverses the order of the sort.

Manual Move — /MM

This command lets you move existing columns/rows to new locations in the worksheet. After you type **/MM**, you are asked: **FROM . . . TO?** Respond with the address of any cell in the column or row you wish to move, a period (.), then the equivalent address of the destination column or row. If you are moving columns, the row specified must be the same in each case; if you are moving rows, the same column must be specified. For example, to move Column C to Column F, the addresses you enter would be **C1.F1** or **C3.F3** but not **C1.F3** or **C3.F1**. If you try to enter a non-equivalent address, the message **INVALID** appears.

The Printer Output Command — /P

This command sends a copy of your worksheet or any part of it to your printer or to a textfile. You can use any printer that can be connected through the computer's serial port (on the rear panel of the computer).

When you type **/P**, the message **RANGE?** appears on the screen. Respond with the cell addresses of the top left and bottom right corners of the area you want to print or send to the textfile (for example, **A1.E10**). Pressing **ENTER** without specifying a range prints/sends the entire worksheet.

Next, if pagination (**/APP**) is on (the default), you are asked to enter the **TITLE?** Enter the filename and press **ENTER**.

Note: If you have closed the current printer device or file using the command **/APC**, DYNACALC displays **OUTPUT PATH NAME** before the **RANGE?** prompt.

You can adjust five settings to change the way that DYNACALC sends output to the printer: borders (yes or no), number of lines per page, pagination (yes or no), line spacing, and line width. Current settings are displayed before you print your worksheet. To change a setting, press **CLEAR** **BREAK** to exit the print command and access **/AP**. Press **/P** again when you are ready to return to the print command.

To interrupt printing, press **CLEAR** **BREAK**. To resume printing, press **CLEAR** **BREAK** again. Press **ENTER** while you are paused in printing to cancel the printout.

The Quit Command — /Q

Use this command to exit DYNACALC or pause in your work. When you type **/Q**, a new menu appears:

EXIT TO: O S

/QO returns you to the OS-9 operating system. This destroys the current worksheet, so be sure that you save it on diskette if you want to use it later. Before you exit, DYNACALC asks: **ARE YOU SURE?** Respond **Y** to exit or **N** to continue working on the worksheet.

/QS interrupts the program and blanks the screen until you press any key to restore normal operation. Your worksheet is left intact.

The Replicate Command — /R

This command lets you copy the contents of a cell or range of cells to another part of the worksheet, making it unnecessary to retype expressions and values you use frequently.

The range of cells to replicate must be in the same column or same row. See the explanation of the **/S#S** and **/S#L** commands, later in this section, for instructions on moving blocks of data.

After you type **/R**, the prompt **SOURCE?** appears. To copy a single cell, enter its address, and press **ENTER**. To copy the current cell, you need only press **ENTER** without typing its address. To specify a range of cells, enter the address of the first cell (or skip the address if the first cell to duplicate is the current cell), a period **<. >**, and the address of the last cell. Press **ENTER**.

Next, you are asked for a destination location. Enter the cell or range of cells as explained above.

If the SOURCE cell contains an expression, a new prompt appears on Line 1: **(S)AME OR (R)ELATIVE**. The expression is displayed in Line 3, and the cursor is located over the first value reference in the expression. You must answer the **SAME OR RELATIVE** prompt for each value reference in the expression. If you respond with **S**, that reference is copied literally into the destination cell(s). If you answer with **R**, all occurrences of this value reference are modified according to the destination location in the worksheet. For example, to copy the sum function, @SUM(A1 . . . A5, located in A7 and place it in cells B7 through F7, use R (for Relative). This way the expression changes for each column — @SUM(B1 . . . B5), @SUM(C1 . . . C5), and so on.

You can replicate all or part of any column or row to one or more places in the worksheet. Continuing with the previous example, suppose that cells A1 through A5 contain values. You want to copy this data and the sum in A7 to another column. The command to use is **/R A1.A7 (ENTER) B1 (ENTER)**. This replicates Column A in Column B. You can move the cursor to B1 and use the **/DC** command to delete the column if you actually try this experiment. Similarly, you can type **/R A1.A7 (ENTER) B1.F1 (ENTER)** to fill Columns B-F with data from Column A.

The **/R** command copies not only the contents of a cell (label, value, or expression), but also the cell's format. This enables you to use the command to change the format of a large number of cells at once, without changing the window format.

The System Command — /S

This command lets DYNACALC communicate with your disk hardware using its own built-in operating system. By using /S, you can save and load full or partial worksheets and perform other system-related tasks. After you type /S, a new menu appears:

SYSTEM: C L S X # ?

Change Directory — /SC

When you type /SC, DYNACALC asks you for a new directory name. Type the new name, and press **(ENTER)**.

Load Worksheet — /SL

This command loads a previously saved worksheet onto the screen. The prompt **LOAD : PATH NAME?** appears. Type the filename and press **(ENTER)**.

If a worksheet is currently displayed on the screen, it is not erased when the new worksheet is loaded. Instead, the file you load overlays cells on an individual basis. Any unused or blank cell on the saved worksheet has no effect on the contents of the currently displayed (target) worksheet. If, however, the cell has a specific format when it is saved, that format becomes the format of the target worksheet. Non-blank cells in the saved worksheet temporarily overwrite existing cells.

As an example of the way you can use this command, you might save a pricing table in a diskette file and then use it to overlay a variety of worksheets based on it. Then, if prices increase, you have only one file to change.

If you choose this option and decide not to overlay the displayed worksheet, type /C and answer **Y** to confirm that you want to clear the worksheet before loading a new one.

All /SL operations default to the CAL extension on the current default drive.

Save Worksheet — /SS

This command saves the entire current worksheet and all current settings on diskette. When you type /SS, the prompt **SAVE : PATH NAME?** appears. Enter the filename you want to assign to this worksheet and press **ENTER**. The filename you choose defaults to a CAL extension and is saved on the current default drive.

If the filename already exists, you are asked if you want to delete the original. Type **Y** to delete the old file and save the worksheet under that name, or type **N**, enter the /SS command again, and choose another name for your file.

When you save a worksheet, all cells in the worksheet are saved on the diskette, even though they may not be on the screen. All flags you have set are saved and will be restored when you load the file again.

Note: To save a partial worksheet, see the explanation of the /S#S command in this section.

Execute OS-9 Command — /SX

When you type /SX, the OS-9 command prompt appears: **OS9>**. You are still working from within DYNACALC, but you can execute any legal OS-9 command from this prompt by typing the command and pressing **ENTER**.

After you execute most OS-9 commands, the **OS9>** prompt reappears. You can then enter another command or press **ENTER** to return to DYNACALC and your current worksheet.

If you execute a system command from the OS9> prompt that changes the system (for example, change directories), the program automatically exits DYNACALC to complete the command. After the command is executed, the OS9: system prompt appears. Press **CLEAR** **BREAK**. The message OS9: EOF is displayed and the OS9> prompt reappears. Press **ENTER** to return to your current worksheet.

Date Loading and Saving — /S#

The /S# command lets you load and/or save part or all of a worksheet in a textfile format compatible with other BASIC software.

Note: Only value and label information is saved and loaded. Cells containing expressions are evaluated, and their current values are saved. To save expressions, use the /SS and /SL commands discussed earlier. Cells containing errors are saved as blank cells. No widths, formats, and so on are saved. Use /SS to save these.

To load data, position the cursor at the cell at which you wish the loaded information to start, and then type /S#. A new menu appears:

DATA FILE: L S ?

Type **L**. DYNACALC asks for a PATHNAME? When you enter a filename, DYNACALC loads the data from the file you specified into your worksheet, beginning at the current cell.

Before data transfer begins, you are asked whether the data is to be loaded by Column or by Row. To load data in the same way as it was saved, type **D** (for Default). The load operation usually affects only non-blank cells being loaded. This lets you overlay a worksheet with data tables prepared previously with DYNACALC or other system programs. (See the appendix, "Using Data Files," for more information.)

DYNACALC examines each line of incoming data during the /S#L operation to see whether it contains value or label information. If the line begins with 0-9, a minus sign, a plus sign, or a decimal point, it is treated as a value. All other lines are treated as labels. To input a label that otherwise looks like a value to DYNACALC, precede it with a single quotation mark (?).

DYNACALC treats the cell as a label and deletes the quotation mark automatically.

To save data, type /S#S at the READY message. You are asked for a filename and whether data is to be saved by column or by row. Enter the filename, and the **C** to save by column, **R** to save by row, or **D** to save in the order (column/row) used last.

You are next asked for a range of cells to save. Respond with the addresses of the top left and bottom right cells to be included in the save. Pressing **ENTER** without entering a range saves the entire worksheet.

Both the /S#L and /S#S commands default to the DAT extension and are loaded and saved from the current default drive.

The Titles Command — /T

This command lets you set up horizontal (column) and/or vertical (row) titles. Titles are columns and /or rows, which usually contain labels, that you set aside to identify important areas of your worksheet. Titles do not scroll off the screen when the displayed area changes. You can see, for example, the name of the salesman who performed well in October, even though names are in Column A, and October is in Column L.

You cannot move the cursor to any column or row being used as a title. If you need to change a title, deactivate the title using the **/TN** command described below. You can then make the change and reactivate the title using one of the title commands explained below. You can save your title information with the **/SS** command.

When you type **/T**, a new menu appears:

TITLES: B H N V ?

Horizontal and Vertical Titles — /TB

This command defines labels as titles in both a horizontal and vertical direction. To set the titles, place the cursor one row below and one column to the right of the intersection point of the horizontal and vertical labels. Now type **/TB**. The labels are now defined as titles and will not scroll off the screen.

Horizontal Titles — /TH

This command defines horizontal titles. Move the cursor one row below the title row(s), and type **/TH**. Now when you scroll through the worksheet, the titles are left undisturbed.

No Titles — /TN

This command deactivates any titles which are set.

Vertical Titles — /TV

This command defines vertical titles. Move the cursor to the right of the title column(s), and type **/TV**. The titles remain undisturbed when you scroll.

The Window Command — /W

This command is one of your primary means of formatting screens. When you work with a worksheet, the screen displays a window, or portion, of the total worksheet. By using the arrow keys, you can scroll the window to any part of the worksheet you desire. However, you might occasionally want to see two widely separated sections of the worksheet at the same time. The **/W** command lets you do this easily. Note that you cannot divide a screen into more than two windows, either horizontally or vertically. All information about windows can be saved using the **/SS** command and restored using the **/SL** command.

When you type **/W**, a new menu appears:

WINDOW: D F H N S U V ?

Value/Formula Display — /WD

This command toggles the value/formula display setting. The setting, which defaults to “value,” determines if calculated values or actual entered data is printed. The primary use for this formula display is to tell at a glance whether a cell contains a formula or constant. This command affects the entire current window, and **only** the current window.

Default Display Format — /WF

After you type **/WF**, a new menu appears:

FORMATS: D G R L P I \$ C ?

/WFD, the default format command, defaults all cells in the current window to the general format, described next.

/WFG, the general format command, left-justifies labels and right-justifies numbers within the current window.

/WFR, the right-justification format, right-justifies any label or number in the current window.

/WFL, the left-justification format command, left-justifies labels or numbers in the current window.

/WFP, the plotting format command, activates the plotting format, used for creating horizontal bar graphs within your worksheet. The numbers in all cells of the window are rounded to the nearest integers, and the resulting numbers are used in counting graph characters as they print. Refer to “Characters for Printing Graphs —/AG” for information on graph characters.

/WFI, the integer format command, rounds all cells in the window to the nearest whole number and right-justifies data within the cells. Rounding affects only the numbers displayed, not the actual numbers stored in memory. If you reference any cell in the window in an expression, its original, unrounded value is used.

/WF\$, the dollar format command, formats all cells in the window to hold data that is rounded to two decimal places. The cells’ values are displayed with a decimal point and two following digits, even if those digits are 0s. Rounding affects only the cells displayed, not the actual numbers stored in memory. As in the /WFI command, if you reference a cell in a window formatted with this command in an expression, its original, unrounded value is used.

/WFC, the continuous format command, is used only for windows containing labels. This format uses the character(s) entered in repetition to fill the width of the cell, regardless of its current or future width. A typical use for this type of format is creating borders between windows in your worksheet. For example, you might enter a hyphen (-) as a label and select /WFC for the window. This fills the window with hyphens (-----).

Separating Windows Horizontally — /WH

This command creates a horizontal separation between the upper and lower portions of the screen. Each portion is then considered a separate window and can be moved and formatted independently of the other. When you type **/WH** , the screen splits at the current row, letting you divide the screen into equal or unequal sections. Use **SHIFT**  to move back and forth between the two windows. The window in which the cursor resides is considered to be the “current” window. Commands that affect windows affect only the current window.

No Separation of Windows — /WN

This command returns the screen to a single window display, leaving the current window unchanged.

Synchronous Scrolling — /WS

This command causes a split window display to scroll simultaneously. If the windows are divided horizontally, scrolling occurs in a left-right direction. If the windows are divided vertically, scrolling occurs in an up-down direction. This command has no effect on a single window.

Unsynchronous Scrolling — /WU

This command deactivates the **/WS** command and causes scrolling to remain separate between two displayed windows. If only a single window is displayed, this command has no effect.

Separating Windows Vertically — /WV

Use this command to create a vertical separation between two parts of the screen. Each part is treated as a separate window and can be formatted or scrolled independently. When you type **/WV**, the screen splits vertically at the current column, letting you divide the screen into equal or unequal parts. Use **SHIFT**  to move the cursor between the two windows. The window in which the cursor resides is considered to be the current window. Any window commands you use apply to only the current window.

Functions

Arithmetic Operations

The building blocks of all calculations and built-in functions you use with DYNACALC are the basic math operations: addition (+), subtraction (-), multiplication (*), division (/), and exponentiation (^). These operations are used in DYNACALC in the same way as you use them every day and can be combined in unlimited ways to perform math on your worksheet.

All regular math operations in DYNACALC are performed to 16 digits of accuracy. The numbers you use are limited to the range $+/- 1.0e-37$ through $9.999 \dots e37$. You can enter them in any format you like (excluding embedded commas as in 9,999).

To negate a number, subtract it from 0 ($0 - x$). Instead of typing, for example, **-G5** to negate the value in cell G5, type **0 - G5**. You may use negative numbers as constants (-3 , $-2.5e8$, and so on).

Numbers are displayed according to the number of characters available in the cell and the display format (/FI, /F\$) chosen. If the number contains too many digits to be fully displayed, it appears in scientific notation, if your column width format is large enough. Otherwise, the cell is filled with >>>>> to indicate a display “overflow.” You can increase the column width with /AWC or /AWW.

Operators

The plus operator, +, adds values and yields their sum. The minus operator, -, subtracts the second value from the first and yields the difference. The multiplication operator, *, multiplies two values to give the product. The division operator, /, divides the first number by the second to yield the quotient. The exponentiation operator, ^, raises the first number to the power of the second number. All these operators require two operands. In other words, you must use at least two numbers in performing any of the above operations.

Arithmetic Functions

DYNACALC contains several built-in mathematical functions to make it easier for you to perform complicated math on your worksheet. In DYNACALC, a function is defined as a mathematical relationship between independent and dependent variables. Most DYNACALC functions require one or more independent variables, furnished as arguments. The function then returns the dependent variable. A few DYNACALC functions — @ERROR, @NA, @PI, and @RND — require no arguments and return a pre-defined value or condition.

As an example, consider the square root function, @SQRT. This function requires only a single argument, and its return value is the square root of the argument. To find the square root of 4, you would type @SQRT (4) **(ENTER)**. The function, @SQRT (4), is placed in the current cell. From now on, each time you recalculate the worksheet, that function is performed.

If you use several cells containing functions of constant values, evaluate the function once, then place the value returned in the cell as a constant. This saves time by relieving DYNACALC of having to recalculate the function each time calculations are performed. To do this, type ! after the function. For example, type **@SQRT(4)!** to cause the square root of 4 to be displayed as a constant in the cell.

Functions are not limited to using constants as arguments. The arguments can also be expressions, results of other functions, and/or cell addresses. For example, the function, **@SQRT(G5)** returns the square root of any value appearing in cell G5. If your cell contents change, the function is recalculated. If you want to know the value of a cell at one particular time only and not any subsequent change, you can type ! before you press **ENTER**. The function is evaluated once, placing the current value returned in the cell. This value then becomes a constant, needing no recalculation.

Most DYNACALC functions that accept a range of cell addresses as arguments (**@AVERAGE**, **@CHOOSE**, **@COUNT**, **@MAX**, **@MIN**, **@STDDEV**, and **@SUM**) also accept any rectangular area of the worksheet, including any number of columns or rows. Simply supply the addresses of the top left and bottom right cells to include in the range. For example, **@SUM(B3:E8)** returns the sum of the values of all cells B3-B8, C3-C8, D3-D8, and E3-E8. Note that the **@INDEX**, **@LOOKUP**, and **@NPV** functions accept ranges of cell addresses in only one column or row.

You can abbreviate functions to three characters plus the argument upon which the function should be performed. If you use more than three characters, they must all be typed correctly: **@SQ4**, **@SQR4**, **@SQ(4**, **@SQ(4)**, and **@SQRT(4)** are all valid entries that perform the same function.

The trigonometric functions in DYNACALC require that you enter angular arguments expressed in degrees or radians, depending upon the way you have the /AD switch set. DYNACALC defaults to degrees if you do not set the switch.

Help Information

You can see help information for any DYNACALC function by typing **/?@** at the **READY** message. Functions are listed in groups on the help screens.

The Functions

Functions are listed in alphabetic order for ease of reference. Values or cell addresses are represented by **x**.

@ABS(x) — Absolute value function. This function returns the value of the argument with its sign forced to positive. Use this function for checking to see if a number is negative. For example, the expression, **+H1-@ABS(H1)** returns a **0** if the value in cell H1 is **0** or a positive number and returns a non-zero if H1 contains a negative number.

@ACOS(x) — Arc-cosine function. This function returns the inverse cosine of the argument.

@ASIN(x) — Arc-sine function. This function returns the inverse sine of the argument.

@ATAN(x) — Arc-tangent function. This function returns the inverse tangent of the argument.

@AVERAGE (x.y) — Arithmetic mean function. This function returns the average numeric value of all cells in the range. The range can consist of any combination of cells, ranges of cells, expressions (including functions), or constants. For example, **@AVERAGE (E5,R6,R89,17,23.5, @SQRT(A3),B7)** returns the mean value of the contents of cell E5, the contents of cells R6 through R89, the constants 17 and 23.5, the square root of the contents of cell A3, and the contents of cell B7. Blank cells or cells containing labels do not affect the average.

@CHOOSE(n,x,y) — DYNACALC selects a value from a list of two or more values. The first argument, **n**, is used as an index into the list of values **x,y**. For example, **@CHOOSE(A4,B5,E5)** first looks at the value of cell A4. If it is 1, the value of cell B5 is returned. If the value of cell B5 is 2, it returns the value of cell C5, and so on. Although the first argument must be a constant, expression, or a single cell address, the list of values **x,y** can be spread throughout the worksheet. **@CHOOSE (6-H4,13,G4, H3.H12,B1, G1)** first subtracts the value of cell H4 from the constant, 6. Next, the difference is used as a pointer to the list consisting of the constant 13, cell G4, and values from parts of column H and row 1.

@COS(x) — Cosine function. This function returns the cosine of **x**, where **x** is an angle expressed in degrees or radians.

@COUNT — Returns the number of items in a list. **@COUNT** counts only arguments that represent numbers, so blank cells and cells containing labels do not affect the count.

@ERROR — Forces an **>RE<** condition wherever it is used. Use this function most often with **@CHOOSE**, **@INDEX**, or **@LOOKUP** to report attempted accesses of invalid table entries. For example, you can place **@ERROR** in cell B4. Then, place **@CHOOSE(B1,B3,B5)** in another part of the worksheet. If B1 has the value 2, **@CHOOSE** returns **>RE<**.

@EXP(x) — Natural antilogarithm function. This function returns the value of **e** (2.718 . . ., the base of the natural logarithm system) to the **x** power. This is the inverse of the **@LN(x)** function, described later.

@INDEX(n,x.y,z) — Returns a value or label from a list or number of lists. The first argument, n, must be a value, not a label. This value can be a constant, cell address, or expression. The value is used as a comparison value for searching the range of cells specified in the second argument, x.y. This range must be a single range of cells in one column or row. The third argument, z, is optional and specifies the column or row from which the returned value is taken. If you omit the third argument, the returned value comes from the column just to the right of the column in the second argument or, if a row was specified in the second argument, from the row just below that one.

@INDEX works in a manner similar to @LOOKUP, described later.

@INT(x) — Integer function. This function returns the whole number portion of the argument. Any fractional part of the number is ignored. This function is not the same as rounding. To round numbers, use the @ROUND function. Also note that @INT works in the same way on positive and negative numbers.

@LN(x) — Natural logarithm function. This function returns the logarithm of the argument to the base e (2.718 . . .). This function is the inverse of @EXP(x).

@LOG(x) — Common logarithm function. This function returns the logarithm of the argument to the base 10. The inverse of @ LOG(x) is 10^x .

@LOOKUP(n,x.y,z) — Works in the same way as @INDEX except that the comparison between the first argument and the values in the second argument is made for a “greater than” condition rather than for an exact match.

@MAX(x.y) — Maximum value function. This function returns the greatest value found in the list x.y. The list can be simple or complex, just as in @AVERAGE.

@MIN(x.y) — Minimum value function. This function returns the smallest value found in the list x.y. The list can be simple or complex.

@NA — Forces a **>NA<** (Not Available) error condition wherever it is used. Use this function most often with **@CHOOSE**, **@INDEX**, or **@LOOKUP** to report attempted accesses of invalid table entries. For example, put **@NA** in cell B4. Then, put **@CHOOSE (B1,B3,B5)** in another area. If B1 contains the value 2, **@CHOOSE** will return **>NA<**.

@NPV(r,x.y) — Net present value function. This function returns the net present value at discount rate r for payback in range x.y.

@PI — Returns the value of Pi (3.14 . . .).

@RND (x) — Generates random numbers. This function is useful in generating test data and for certain statistical applications. **@RND** requires a single argument, which can be a constant, cell reference, or an expression. **@RND** uses the argument to determine the maximum value of the random number to be returned. The range is from 0 to x - 1, where x is a positive argument. If x is negative, the range is from 0 to x + 1. **@RND** always returns integer values, except when x is 0. This function works best with a maximum value for x of 65535.

@RND is evaluated each time your worksheet is recalculated, so the returned number will change.

If you need to generate numbers that don't change, save the numbers with the # key. DYNACALC's keysaver feature lets you do this even on a large group of random numbers. For example, if you wish to freeze a column of random numbers, move the cursor to the first cell in the column, and type:

/BREAK # [ENTER] v /K255 [ENTER]

Turn off the automatic recalculation feature (/AR) before performing the operation to keep the random numbers from changing each time the # key is executed.

@ROUND(d,x) — Value rounding function. This function reduces the precision of calculation to a degree you can control. You might use @ROUND in some cases so that DYNACALC can duplicate exact results obtained by other calculators that round after all operations. The first argument is a value equal to an exact power of 10 (.001, 10, 1000, 1e6, and so on) that specifies the degree of rounding. You may use from 1e-9 to 1e9 as degrees of rounding. The second argument is the number to be rounded. Either argument can be a constant, cell address, or expression. Unlike the I and \$ display formats, the @ROUND function actually changes the value of the cell in which it is used. Any subsequent calculations based on this rounded value are affected.

@SIN(x) — Sine function. This function returns the sine of x, where x is an angle expressed in degrees or radians.

@SQRT(x) — Square root function. This function returns the value of the positive number which, when multiplied by itself, equals the argument x.

@STDDEV(m,x.y) — Standard deviation function. This function returns the standard deviation of values in the range x.y, using method m. Like @AVERAGE, @STDDEV can apply to any number of constants, cells, or ranges of cells. If m is negative, the population method of calculation is used. If m is 0 or positive, the sample method is used. Variance can be calculated by squaring the standard deviation.

@SUM(x.y) — Summation function. This function returns the total value of all cells in range x.y. As in @AVERAGE, the range can be any combination of constants, cell addresses, and ranges of cells.

@TAN(x) — Tangent function. This function returns the tangent of x, where x is an angle expressed in degrees or radians.

Logical Functions

In addition to its built-in math functions, DYNACALC also has a complete set of logical, or decision-making, functions. These functions are usually used with logical comparison operators.

The logical operators are:

=	equal to	> = or = >	greater than or equal to
<>	not equal to	<	less than
>	greater than	< = or = <	less than or equal to

You can use all the logical operators to test the relationship between numbers and/or cell contents. Constant numbers can be tested against cells. For example, **Q12=0** returns 'true' if the content of cell Q12 is 0 and returns 'false' if the content of cell Q12 is anything other than 0. Even two constants can be compared. **3=3** returns a 'true' value, and **3>4** returns a false value.

Logical operators also test the relationship between labels or strings of characters. Labels to be tested must be cell contents — you cannot use constant labels as you can constant numbers. For example, **C4=C5** returns a 'true' value if cells C4 and C5 contain identical labels and 'false' if the labels differ. The > or >= operators apply alphabetically when used with labels.

To understand the way logical operators and functions work, you first need to know that they work with a special data type: the "logical value." A cell that holds a logical value must hold one of two possible values, a "true" or "false" value.

One way to set a logical value is to use the logical, or comparison, operators. One of the simplest operators is =, which compares a number or the contents of a cell with another number or cell content. For example, the logical expression, **B6=C9**, means “Compare the contents of cells B6 and C9. If they are equal, return a logical ‘true’. If they are not equal, return a logical value of ‘false’.”

The simplest way to put a logical value into a cell is to use the functions @TRUE and @FALSE.

@TRUE — This function forces a cell to contain a logical value of true.

@FALSE — This function forces a cell to contain a logical value of false.

Two special logical functions are provided to help you initially set up a worksheet and determine whether data has been entered.

@ISERROR — This function returns ‘true’ if the cell contains an error.

@ISNA — This function returns ‘true’ if the cell contains a “not available” condition.

Use the following functions to perform operations on logical values:

@IF — This function tests a logical value and returns one of two possible results, depending upon the state of the logical value. @IF requires three arguments, in the following order:

1. The logical value to be tested (a cell reference or a logical function like @IFERROR)
2. The result to return if the first argument is ‘true’
3. The result to return if the first argument is ‘false’

The second and third arguments can be constant numbers or cell references. If you use a cell reference, the target cell can contain a number or a label. For example, **@IF(AB3,X1,Y2)** tests the logical value of cell AB3. If it is true, @IF returns the number or label in cell X1. If not, @IF returns the number or label in cell Y2.

@NOT — This function takes a single argument and returns the logical complement, or opposite, of the supplied logical value. For example, **@NOT(@TRUE)** returns ‘false’, and **@NOT(A6=B5)** returns ‘false’ if cells A6 and B5 have equal contents. In other words, @NOT reverses the sense of logical expressions.

@OR and **@AND** — These functions are normally used with two or more cells. @OR returns ‘true’ if **any** of the logical values referenced are true, while @AND returns ‘true’ only if **all** the logical values referenced are true. These two functions accept a list of cells or ranges of cells, just like the math functions @AVERAGE, @SUM, and so on. For example, **@OR(A4:B9)** returns ‘true’ if at least one cell in A4-A9 or B4-B9 is true.

@EOR — This function is used only with two arguments. In the example, **@EOR(E4,J17)**, ‘true’ is returned only if the logical values held by cells E4 and J17 are **different**.

Advanced Sample Session

This section lets you recall the file you saved in the first Sample Session and expand the worksheet using some of the commands discussed in the Commands and Functions section.

Load your DYNACALC program and access an empty worksheet. You can now load your sample file by following these instructions:

1. Type:

/SL

2. When the prompt **LOAD : PATH NAME?** appears on the screen, type:

SAMPLE **(ENTER)**

The budget worksheet you created in the first Sample Session appears on the screen. You are now going to expand it so it looks like the example shown below:

A	B	C	D	E	F	G	H	I	J
1		APRIL	BUDGET						
2		INCOME	1000.00						
3									
4	BUDGET	BUDGETED		% OF		ACTUAL			
5	CATEGORY	AMOUNT		INCOME		AMOUNT		VARIANCE	
6									
7	RENT								
8	UTILITIES								
9	CAR/GAS								
10	FOOD								
11	MISC.								
12									
13	TOTAL								

Compare the two worksheets, and notice the differences between them. The last two columns, **ACTUAL AMOUNT** and **VARIANCE**, have shifted to the right, a new column, **% of INCOME**, and two new rows, **UTILITIES** and **TOTAL**, have been added.

To begin making the worksheet changes, use the Move command to move the columns.

Follow these steps to move the **VARIANCE** column from Column G to Column I:

1. Place the cursor in cell G1 and type:

/MM

Note: You can place the cursor in any cell in the column as long as you use the corresponding cell address in the destination column.

2. The prompt **MOVE FROM. . .TO** appears on the screen. Type the current cell address, period <.>, and the corresponding cell address in the destination column:

G1.I1 ENTER

Notice that when you type the period, three dots appear on the screen.

The entire **VARIANCE** column shifts to the I column.

Now move the **ACTUAL AMOUNT** column from Column E to Column G.

1. Place the cursor in cell E4 and type:

/MM ENTER

2. The prompt **MOVE FROM... TO** appears on the screen. Type the current cell address, period, and the corresponding cell address:

E4.G4 (ENTER)

The entire **ACTUAL AMOUNT** column moves to Column G.

Move the cursor to the **VARIANCE** column and position it in cell 17. Look at the expression displayed in the first message line. The expression has changed from **C7-E7** to **C7-G7**. *DYNACALC automatically updates all expressions affected by a column move.*

The expanded worksheet includes a new column in Column E, **% OF INCOME**. Place the column heading in cells E4 and E5:

1. Place the cursor in cell E4 and type:

% OF (ENTER)

2. Place the cursor in cell E5 and type:

INCOME (ENTER)

This new column, **% OF INCOME**, will use the income amount displayed in cell D2 and the budgeted amount in Column C to give you a percentage of income by category. The equation that produces this information is **BUDGETED AMOUNT – INCOME TOTAL**. If you transfer this equation into an expression using cell addresses, it becomes:

C{7 – 10}/D2

Insert the correct expression into the specified cells.

E7 — (C7/D2) **(ENTER)**

E8 — (C8/D2) **(ENTER)**

E9 — (C9/D2) **(ENTER)**

E10 — (C10/D2) **(ENTER)**

The results appear in each cell as soon as you enter the expression.

Use the Insert Command to insert the new budget category row, UTILITIES, between RENT and CAR/GAS.

1. Place the cursor in cell A8 and type:

/I

2. When the prompt **INSERT: CR?** appears, type:

R

A new, blank row appears in row 8. The remaining rows have shifted down one row, and all expressions that reference these rows have been changed.

Enter the following information for this new budget category in the specified cells:

A8 — **UTILITIES (ENTER)**

C8 — **150.00 (ENTER)**

E8 — (C8/D2) **(ENTER)**

G8 — **125.00 (ENTER)**

I8 — (C8-G8) **(ENTER)**

The new worksheet also includes another new row, **TOTAL**, which will contain the totals for each of the columns. Move the cursor to A13, and type the row heading:

TOTAL **(ENTER)**

To obtain the total information, you can use an arithmetic expression such as $C7+C8+C9+C10+C11$, but DYNACALC provides a built-in function that will more easily provide the same information. Use the **@SUM** function to total each of the columns. Enter the following expressions in each of the specified cells:

C13 — **@SUM(C7.C11)** **(ENTER)**

E13 — **@SUM(E7.E11)** **(ENTER)**

G13 — **@SUM(G7.G11)** **(ENTER)**

I13 — **@SUM(I7.I11)** **(ENTER)**

Using this **@SUM** function immediately gives you the total for each column.

Notice that the total in the **BUDGETED AMOUNT** column now exceeds the total income shown in cell D2. Move the cursor to cell D2, and change the income amount to **1200.00**. Watch how all the information on your worksheet changes.

Your new expanded worksheet now looks like this:

BUDGET CATEGORY	APRIL INCOME	BUDGET 1200	% OF INCOME	ACTUAL AMOUNT	VARIANCE
	BUDGETED AMOUNT				
RENT	400	0.3333333	400	0	
UTILITIES	150	.125	125	25	
CAR/GAS	250	.2083333	240.5	9.5	
FOOD	150	.125	175	-25	
MISC	200	.1666667	150	50	
TOTAL	1150	.9583333	1090.5	59.5	

Save this worksheet on your DYNACALC diskette so you can access it for additional practice sessions. Type

/SS

When the **LOAD : PATH NAME?** prompt appears, type:

ADVSAMPLE ENTER

Continue to experiment with DYNACALC by inserting new values into the worksheet and trying additional commands discussed in the Commands and Functions section. As you become more familiar with this program, you will find that it has unlimited uses.

Appendix A — Format and Backup Instructions

Before using a diskette, you must format it. You may then use these diskettes to make backups of existing diskettes or as data diskettes for storing files.

Format

1. Be sure your computer and all peripherals (TV and disk drive(s)) are turned on.
2. Get a blank diskette. Be sure the write-protect notch is **not** covered by a foil tab.
3. Turn on your system.
4. Insert the blank diskette into Drive 0, and close the drive door.
5. At the **OK** prompt, type:

DSKINI0 ENTER

6. The computer formats the diskette, and when the process is complete, the **OK** prompt returns to the screen.

If you have more than one disk drive, you can format a diskette in another drive by substituting the appropriate drive number for Drive 0. For example, DSKINI1 formats the diskette in Drive 1.

Backup — One Disk Drive

1. Be sure your computer and all the peripherals are turned on.
2. Insert your Source diskette (the diskette you wish to copy) into the disk drive, and close the door.

3. At the **OK** prompt, type:

BACKUP 0 ENTER

4. The following prompt appears:

**INSERT DESTINATION DISKETTE AND PRESS
<ENTER>**

Remove the Source diskette, and insert the Destination diskette. When you are ready, press **ENTER**.

5. The following prompt appears:

**INSERT SOURCE DISKETTE AND PRESS
<ENTER>**

The computer will continue to prompt you to exchange these two diskettes. Make sure you insert the correct diskette.

6. When the backup is complete, the **OK** message reappears on the screen.

Backup — Two Disk Drives

1. Be sure your computer and all peripherals are turned on.
2. Insert the Source diskette (the diskette you wish to copy) into Drive 0 and the Destination diskette into Drive 1, and close the drive doors.
3. At the **OK** prompt, type:

BACKUP 0 TO 1 ENTER

4. When the backup is complete, the **OK** message reappears on the screen.

Appendix B — Advanced Operating Tips

Determining Function Ranges

Some DYNACALC functions such as @SUM, @AVERAGE, @MAX, and @LOOKUP, allow or require arguments to consist of ranges of cells within a column or row. For example, @SUM(A1 . . . A7) returns the sum of the value of cells A1, A2, A3, A4, A5, A6, and A7.

When you use the Delete, Insert, and Move commands, DYNACALC automatically alters address ranges and expressions accordingly. It is important to give careful consideration to the range boundaries. For example:

1. Start with a clear worksheet. Type ten random numbers into cells A2 . . . A11.
2. Enter the function **@SUM(A2 . . . A11)** in cell A13.

Cell A13 now holds the sum of the ten numbers you entered. It seems logical that rearranging the numbers would not alter the sum.

3. Rearrange the numbers by typing **/MAA2.A11**.

The screen is rewritten with the numbers arranged in ascending order. Observe that the sum in cell A13 is changed.

4. Move the cursor to A13 and look at the function range. The new range limits are the cells holding the values that were previously at A2 and A11.

To avoid this situation, establish the range boundaries by entering a blank cell (or one holding a label) at either end of the range. Include those blank cells when you type in the range.

5. Clear the worksheet and try the example again. This time enter the range as **A1 . . . A12**. A1 and A12 are blank cells. When you rearrange the numbers the sum stays the same.

This practice applies to all functions that use column or row ranges. Because a cell that contains a label works just like a blank cell, you can use border lines to set range limits.

Moving Blocks of Data

The move command (/MM) moves only a single column or row at a time. To move several adjacent columns or rows, you can use several /MMs.

To move a rectangular block of data that is a portion of several columns or rows, use the data storage commands /S#S and /S#L. Use /S#S to save any rectangular area of a worksheet to a disk file. Use /S#L to load this data back in at any starting point on the same or another worksheet.

Setting the Format of an Entire Row or Column

To change the format of an entire row or column without altering the window format, set the first cell of the column or row to the desired format with /F. Replicate (/R) that cell to the range of cells where that format is desired.

Replicating the first value copies the cell contents as well as the format to the target cells. If you have already entered a column of data and then decide to change the format, set the format of a blank cell. Now you can use /R to move this format to the column or row to be changed without altering the contents of the target cells.

You can accomplish the same thing by setting a single cell to the desired format and using Keysaver to repeat the command as many times as necessary. For large numbers of cells, this method is probably slower but can be easier to remember.

Avoiding Forward Reference Calculations

Ordinarily, it is a good idea to avoid “forward references.” In this situation, the value of a cell depends on the contents of another cell that has not yet been calculated. Occasionally, forward references are desirable, as in some successive approximation formulas, but most of the time they are not.

You can spot forward references in your worksheet by repeatedly calculating the sheet without changing any data. To do this, press F9 several times, and watch any suspected cells. If the cells change in value, there is a forward reference somewhere on the sheet.

You can try changing the order of calculation (/AO). The formula dump mode (toggled on/off by /WD) is very useful if further searching is required.

Speeding Things Up

Although DYNACALC is very fast, there are several things you can do to reduce delays.

Plan your equations for simplicity. Avoid recalculating the same value again and again. Calculate it once, put the answer in a cell, and reference that cell. For example, instead of placing the constant $1/(2*\text{@PI})$ in a cell, enter it on the data entry line and press F9 . The value is calculated and stored for future reference.

When you need to enter several values on a worksheet that contains a number of arithmetic operations, you can save time by turning off the automatic recalculation feature (toggled on/off by /AR). When you are ready to recalculate, you can press **!** or type **/AR** and return to automatic calculation. Automatic or manual recalculation is indicated on Line 2 of the display (X,A or X,M).

Advancing the Cursor Automatically

When you press **ENTER** to transfer the contents of the data entry line to the current cell, the cursor remains at that cell so that you can make changes. To activate automatic cursor advancing, press any arrow key to enter the first cell in a series. When you press **ENTER**, the cursor now moves in the same direction as the arrow key that you selected. To get out of this mode, press **ENTER** while the **READY** prompt is displayed, or execute any command.

Pointing to Cells

When DYNACALC requires a cell address, you have the option of typing the address manually or “pointing” to the desired cell with the arrow keys. Using the pointing option saves time, is easy to use, and can reduce the chances of errors. Watch Line 3 as you move the cursor. Each cell’s address appears and automatically changes as you move in any direction. When you reach the desired cell, proceed with the operation as though you typed the address manually. The cursor then returns to its original point.

Incrementing Cell Values

Usually, when you change a cell's contents, you position the cursor in the cell and type in the new value. There is another helpful option. For example, if you want to increase a value by 20, you can type the new value as **#+20** and press **ENTER**. The symbol # indicates the original value of the selected cell. This procedure works for all arithmetic operations.

Using @LOOKUP and @INDEX

These functions are used to compare a supplied value with values in a table. @INDEX looks for an exact match and @LOOKUP checks for a greater-than condition.

Use @LOOKUP to find the range in a table that is applicable to a particular comparison value. A good example is a table that lists discount percentages for quantities — 1, 2-5, 6-10, and 11-99. If the desired quantity is 7, it is associated with the 6-10 range. @LOOKUP returns the value or label associated with the 6-10 range entry.

@LOOKUP is not appropriate in combination with @MIN, because the comparison value can never be greater than any of the table entries. In this case, the exact matching comparison of the @INDEX function is more useful.

Conserving Memory

DYNACALC's worksheet can have up to 256 columns or 256 rows. With helps disabled, a level one system has about 21K of workspace or room for 1750 numeric cells. Level two systems have about 36K of workspace or room for 3000 numeric cells.

To determine how much memory a cell requires, watch the memory indicator on Line 2 of the screen. The number increases each time you insert data in a cell. Each active cell uses 2 bytes for the pointer, plus a variable amount of memory for the actual cell contents. Numeric entries use a total of 10 bytes (8 for the number and 2 for the pointer). Labels use $x + 2$ bytes, where x is the number of characters in the string. An expression uses 2 bytes for its pointer, 2 bytes for each cell reference, 1 byte for each function call, 8 bytes for each numeric constant (even 0 or 1), and 1 byte each for any other characters, such as commas, parentheses, and so on. In addition, DYNACALC maintains a table of all cells in the active area of the worksheet (as reported by /AS). Each cell takes up 2 bytes in this table.

There are several things that you can do to conserve memory:

- Avoid using a large number of numeric constants in expressions. If a value is used repeatedly in expressions, put it into a cell and use the cell address instead.
- If memory conservation is important, do not use the label entry mode to create borders. It takes less memory to use the Replicate command. For example, you can enter one border character, set continuous format in that cell (/FC), then replicate to the border area(s). Borders expand automatically if you change column widths later.
- Since DYNACALC allocates worksheet space in rectangular areas, the more compact and organized the worksheet, the more memory you can save. For example, if a worksheet has an active cell at H27, all cells from A1-A27 through H1-H27 are placed into the cell table, which requires 2 bytes per cell. You can waste as much as 430 bytes of memory. Keep track of the maximum cell address with the /AS command.
- When you delete extreme-right columns and/or bottom rows, space is still reserved for them. To free this memory, save your worksheet (/SS), clear it from memory (/CY), and reload it (/SL). The worksheet becomes smaller and the memory amount increases.

Protecting Your Worksheet

DYNACALC has several features that can help protect your worksheet and make DYNACALC's operation easier.

- It is helpful to enter any necessary operating instructions off to the side of the worksheet so any one can operate the program.
- Use the Title command to turn on (set) column and/or row titles. When these titles are set, the cursor cannot move into those cells. This technique can save wasted cursor movement.
- To prevent accidental changes of any cell from one type to another, turn on the type-protection feature (/AT).
- To secure window formats, set the window division (if appropriate for your worksheet). Make sure all the columns are wide enough to display worst-case data without overflow. Move the cursor to the place most likely to be used to begin data entry, and save the worksheet on diskette. When you reload, it is ready to go.

Appendix C — Error Messages

>AE<

Argument error. This error message occurs when an equation is entered and the equation's syntax is incorrect. For example, when a specific argument requires some value to the power of 10, but the power of 10 is not supplied and \square is pressed to calculate, the >AE< error message is displayed.

>D0<

Divide by zero attempted. Division by zero is not valid. This error may occur when a cell is referenced and the value of the cell is zero.

>ER<

General purpose error. After a column or row is removed from a worksheet, any reference (in an expression) to cells in the deleted area causes an >ER< error message display. To discover whether the error was caused by a deletion or an operator error, place the cursor in the cell in question. If it is a machine-generated error, @ERROR is displayed on the top line of the screen.

>EX<

Exponent too large. The highest exponent of a number allowed by DYNACALC is the 37th power.

>HO<

Holder overflow. A holder is a temporary location designated to hold partial expressions. DYNACALC allows up to 12 additions per expression, any further addition causes this error message to be displayed.

>LG<	Logic error. Logical operators require a special type of data called a logical value. A logical value is either true or false. If DYNACALC expects a logical value of true or false in a cell location and doesn't find one, the >LG< error message is displayed. Review the worksheet and eliminate or correct the problem.
>LN<	Negative or zero logarithm attempted. Negative or zero logarithms are not valid. This error may occur when a cell is referenced and the value of the cell is negative or zero.
>NA<	Not available. This error message is the result of an attempted access of invalid table entries. Review referenced cells to locate the invalid entry.
>NR<	Negative root attempted. A root is a number that when multiplied by itself an indicated number of times forms a product equal to a specified number. DYNACALC only recognizes positive root numbers.
>OV<	Arithmetic overflow error. DYNACALC limits numbers to $+/- 1.0$. Any number exceeding this causes an overflow error.
>RE<	Reference error. This error message occurs when a calculation is made, and, although the equation's syntax is correct, something referenced in the calculation is false. Examine each component of the equation to determine the problem.
>RN<	Range error. Some functions, such as @INDEX or @LOOKUP, require a range of cells contained in one column or row. If a combination of ranges and expressions is entered instead, a range error is indicated.

>SN<

Syntax error. A syntax error is the result of an improperly entered expression. Check the exact entry of the expression for violations of DYNACALC syntax conventions.

Machine-generated errors are displayed as @ERROR? on the top line of the display.

Appendix D — Using Data Files

DYNACALC can read and write OS-9 data files with the /S#S and /S#L commands. These operations default to the working data directory. You can override the default by typing in a more complete pathname.

The data file format is a standard OS-9 text file. (Refer to your OS-9 operating manuals for more details.) It can be read or written by any system software as an ordinary sequential file. Worksheet data is put into this text file one line per worksheet cell.

For example:

Use the command /S#S to save the block A1. . .H2. (Any rectangular area of the worksheet can be used.) The resulting data file looks like the column on the left. An explanation of each line appears in the column on the right:

*DYNACALC Data File	this is a comment line
January 26, 1983	
/Col	/C indicates saved by column
STRING	first cell contents (A1)
1.23	next cell in column(A2)
@	@ indicates end of column
34	first cell in next column (B)
27.5	next cell in column (B2)
@	
>	> indicates blank cell (C1)
>	C2
@	
>	D1
>	D2
@	
5600000000	E1 full precision always saved

MESSAGE	E2
@	
>	F1
>	F2
@	
>	G1
6	G2 may be constant or calculated value
@	
THE	H1
END	H2
@	

This format is used both for saving and loading. When you prepare other programs to write a data file for DYNACALC, there are a few additional options at your disposal.

- DYNACALC places the symbol > at the beginning of any data file line representing a blank cell. When > is read back into a worksheet, the previous contents of that cell are cleared.
- If you leave a blank at the beginning of a data file line, the contents of that cell are left undisturbed.
- If you want to space things apart or include comments, you can begin the line with an asterisk (*), and the line is ignored.
- You can follow the @ symbol with a “skip count.” A skip count is a decimal number used to indicate how many columns/rows to skip before entering the next column/row of data.
- Start the first non-comment line in the file with /C or /R to indicate how to load the file. If you omit this indicator, DYNACALC defaults to the loading instructions of the most recent /S# operation.
- Use a single quote (‘) at the beginning of any string that starts with a number. Omitting this character generates an error message. The single quote is not displayed on the worksheet.

- If a format error is detected during a **/S#L** operation, the loading stops at the bad cell. The cell's contents are displayed on Line 3 with the cursor pointing to the problem. At this point you have two choices:

Since you are currently in the edit mode, you can correct the error here. After you make the correction, press **ENTER** to continue loading. (Inserting a quote at the beginning of the line does not load the line as a label, because the line is already recognized as a number.)

OR

You can press **ESC**. The loading operation is terminated. You can check the sheet to see how much of the file is loaded and use the OS-9 editor or other utilities to remedy the problem.

Appendix E — Starting OS-9 from BASIC

If you do not have a Color Computer with BASIC version 1.1 or later or if you do not have the OS-9 System, you can type in the following program and use it to start your DYNACALC application.

Enter the following program from Disk Extended BASIC.

```
10 REM ****
20 REM * BOOT OS-9 FROM BASIC
30 REM ****
40 FOR I=0 TO 70
50 READ A$
60 POKE &H5000+I,VAL ("&H"+A$)
70 NEXT I
80 CLS:PRINT" INSERT OS9 DISKETTE"
90 PRINT" INTO DRIVE 0 AND PRESS A KEY"
100 A$=INKEY$:IF A$=" " THEN 100
110 EXEC &H5000
120 DATA 86,22,8E,26,00,8D,0D
130 DATA FC,26,00,10,83,4F,53
140 DATA 26,03,7E,26,02,39,34
150 DATA 20,10,BE,C0,06,A7,22
160 DATA 86,02,A7,A4,6F,21,6F
170 DATA 23,6C,23,AF,24,10,BE
180 DATA C0,06,A6,23,81,13,27
190 DATA 12,AD,9F,C0,04,4D,27
200 DATA 06,6C,23,6C,24,20,E9
210 DATA 7F,FF,40,35,A0,4F,20
220 DATA F8
```

Type the following instruction at the OK prompt to save the above program:

SAVE “*”

Type the following to use this program to start the application:

RUN *

When the prompt appears, insert the DYNACALC diskette and answer the date and time prompts. When the OS-9 prompt appears, type:

DYNACALC

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